dry air being caused to displace moist, and moist air dry, in the open atmosphere. He considers and removes objections, and points out the bearing of his experiments on various questions in meteorology. The formation of cumuli and the cause of the tropical rains are considered; the effect which the absence of aqueous vapour must have upon climate is pointed out; and the *à priori* conclusions to be drawn from the experiments are shown to agree with observation. Reference is made to anomalies of observation which have been hitherto unexplained, but which admit of easy solution by reference to the radiant and absorbent power of aqueous vapour. The author endeavours to supplement the views hitherto entertained regarding the action of mountain masses as condensers of the atmospheric moisture. He accounts for the enormous radiation observed at great elevations, and concludes by showing the possible bearing of his results on the theory of "*Serene*" and of hail.

III. "Distribution of the Surface of the Third Order into Species, in reference to the absence or presence of Singular Points, and the reality of its Lines." By Dr. Schläffle, Professor of Mathematics in the University of Berne. Communicated by Arthur Cayley, Esq. Received December 18, 1862.

(Abstract.)

The theory of the 27 lines on a surface of the third order is due to Mr. Cayley and Dr. Salmon; and the effect as regards the 27 lines of a singular point or points on the surface, was first considered by Dr. Salmon in the paper "On the triple tangent planes of a surface of the third order," Camb. and Dub. Math. Journ. t. iv. pp. 252–260 (1849). The theory as regards the reality or non-reality of the lines on a general surface of the third order, is discussed in Dr. Schläffle's paper, "An attempt to determine the 27 lines, &c.," Quart. Math. Journ. t. ii. pp. 56–65, and 110–120. This theory is reproduced and developed in the present memoir under the heading, I. General cubic surface of the third order and twelfth class; but the larger part of the memoir relates to the singular forms which are here first completely enunciated, and are considered under the headings II.,

III. &c. to XXII., viz. II. Cubic surface with a proper node, and therefore of the tenth class, &c., down to XXII. Ruled surfaces of the third order. Each of these families is discussed generally (that is, without regard to reality or non-reality), by means of a properly selected canonical form of equation; and for the most part, or in many instances, the reciprocal equation (or equation of the surface in plane-coordinates) is given, as also the equation of the Hessian surface and those of the spinode curve; and it is further discussed and divided into species according to the reality or non-reality of its lines and planes. The following synopsis may be convenient:—

I. General cubic surface, or surface of the third order and twelfth class. Species I. 1, 2, 3, 4, 5.

II. Cubic surface with a proper node and therefore of the tenth class. Species II. 1, 2, 3, 4, 5.

III. Cubic surface of the ninth class with a biplanar node. Species III. 1, 2, 3, 4.

IV. Cubic surface of the eighth class with two proper nodes. Species IV. 1, 2, 3, 4, 5, 6.

V. Cubic surface of the eighth class with a biplanar node. Species V. 1, 2, 3, 4.

VI. Cubic surface of the seventh class with a biplanar and a proper node. Species VI. 1, 2.

VII. Cubic surface of the seventh class with a biplanar node. Species VII. 1, 2.

VIII. Cubic surface of the sixth class with three proper nodes. Species VIII. 1, 2, 3, 4.

IX. Cubic surface of the sixth class with two biplanar nodes. Species IX. 1, 2, 3, 4.

X. Cubic surface of the sixth class with a biplanar and a proper node. Species X. 1, 2.

XI. Cubic surface of the sixth class with a biplanar node. Species XI. 1, 2.

XII. Cubic surface of the sixth class with a uniplanar node. Species XII. 1, 2.

XIII. Cubic surface of the fifth class with a biplanar and two proper nodes. Species XIII. 1, 2.

XIV. Cubic surface of the fifth class with a biplanar node and a proper node. Species XIV. 1.

XV. Cubic surface of the fifth class with a uniplanar node. Species XV. 1.

XVI. Cubic surface of the fourth class with four proper nodes. Species XVI. 1, 2, 3.

XVII. Cubic surface of the fourth class with two biplanar and one proper node. Species XVII. 1, 2, 3.

XVIII. Cubic surface of the fourth class with one biplanar and two proper nodes. Species XVIII.

XIX. Cubic surface of the fourth class with a biplanar and a proper node. Species XIX. 1.

XX. Cubic surface of the fourth class with a uniplanar node. Species XX. 1.

XXI. Cubic surface of the third class with three biplanar nodes. Species XXI. 1, 2.

XXII. Ruled surface of the third order and the third class. Species XXII. 1, 2, 3.

IV. "Experimental Investigations on the Stratified Appearance in Electrical Discharges."—"Effect obtained by varying the Resistance." By JOHN P. GASSIOT, F.R.S. Received December 11, 1862.

1. In the 'Proceedings of the Royal Society,' May 26, 1859, I have stated that, "on attaching the terminals of my water-battery (Phil. Trans. 1844, p. 39) to the wires of a carbonic acid vacuum-tube, inserted about 2 inches apart, I obtained a stratified discharge similar to that of an induction coil."

2. The battery remained as it was originally constructed, consisting of 3520 pairs of copper and zinc cylinders inserted in glass cells. As the rain-water with which each cell had been from time to time filled evaporated, they were again charged: this process of evaporation and recharging continuing for several years, during this lengthened period the battery was three or four times cleaned by dusting and wiping the cells, boards, and slips of glass on which the cells rested; but the constant deposition of dust and moisture had so far reduced the static effects of the battery, that this year it would scarcely elicit a spark of about $\frac{1}{5000}$th of an inch in air between the plates of my